

March 19, 1946.

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2,396,777

DRAFT REGULATING APPARATUS FOR COAL BURNING FURNACES

Filed June 4, 1942

Fig. 1.

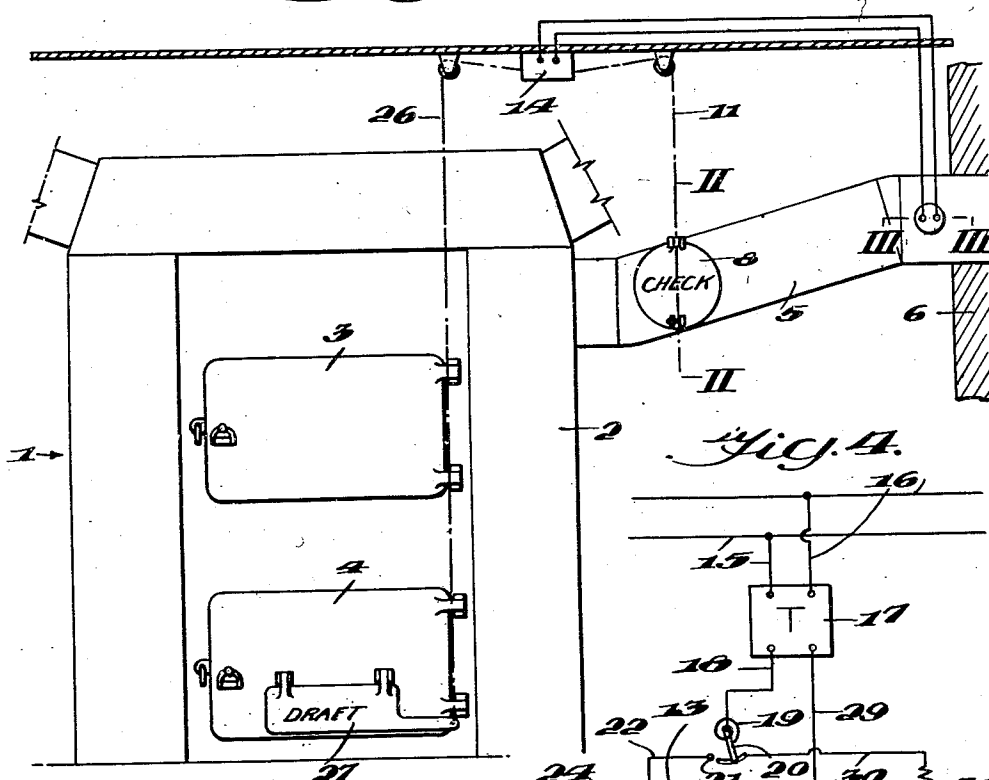


Fig. 4.

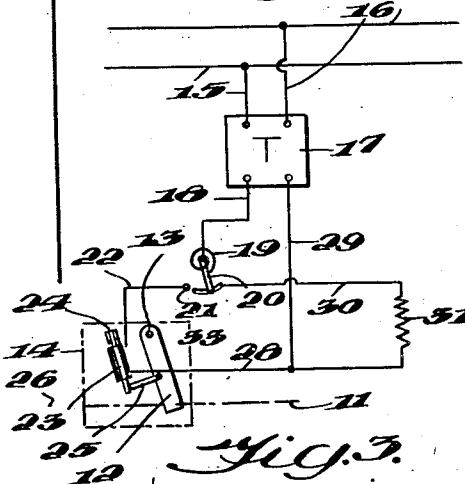


Fig. 2.

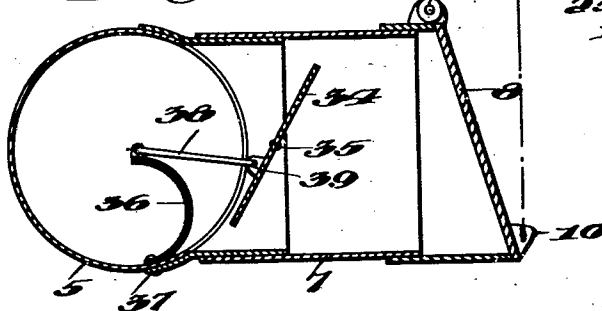
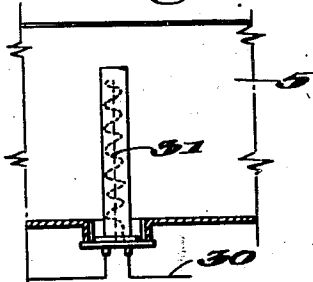


Fig. 3.



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UNITED STATES PATENT OFFICE

2,396,777

DRAFT REGULATING APPARATUS FOR
COAL-BURNING FURNACES

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ten per cent to Louise E. Marks, and thirty-
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Application June 4, 1942, Serial No. 445,784

2 Claims. (Cl. 110-147)

This invention relates to draft control apparatus for furnaces of the type burning solid fuels.

In such furnaces, particularly those which do not employ motor driven fans or blowers, but rely on natural chimney-induced drafts to provide air for combustion sustaining purposes, considerable difficulty is encountered in the matter of regulating such drafts under low heat demand conditions.

It is an object of the present invention to provide an improved automatically operating draft controlling apparatus, functioning under thermostatic regulation, to assure at all stages of furnace operation the admittance of proper volumes of air into the fuel combustion zone of the associated furnace to obtain desired rates of fuel combustion, to provide economies in fuel consumption, to eliminate back drafts in the furnace and, generally, to obtain improved operation from furnaces of the type set forth.

For a further understanding of the invention, reference is to be had to the following description and the accompanying drawing, wherein:

Fig. 1 is a front elevational view of a coal-burning furnace provided with the improved draft control apparatus forming the present invention;

Fig. 2 is a vertical sectional view taken on the plane indicated by the line II-II of Fig. 1;

Fig. 3 is a horizontal sectional view on the line III-III of Fig. 1;

Fig. 4 is a diagrammatic view disclosing electrical circuits and thermostatic means used in the automatic control of my improved draft apparatus.

Referring more particularly to the drawing, the numeral 1 designates a coal-burning furnace, the latter being formed to include the usual casing 2, fuel admitting door 3, an ashpit door 4 and a smoke pipe 5, the latter leading from the top of the combustion zone of the furnace to a chimney 6. Such furnaces operate under natural draft conditions, which are extremely variable and affect the operation of the furnace. To overcome or compensate for these variable conditions, the smoke pipe 5 is provided with the usual laterally directed air-admitting sleeve 7. The open outer end of this sleeve is closed by the customary check door 8, which is hinged as at 9 in connection with the sleeve. To control the operation of the door 8, the lower edge thereof is formed with the ear 10 to which is connected one end of a chain or other flexible cable 11. This cable is connected at its other end with a swing-

ing arm 12 which, as shown in Fig. 4, is pivoted as at 13 within the casing 14.

In order to actuate the arm 12, use is made of an electric circuit comprising the leads 15 and 16 which, connected with any suitable source of electrical energy, are joined with the primary taps of a transformer 17. From the secondary side of this transformer, a conductor 18 extends to a thermostatically actuated switch 19. The movable arm 20 of the switch 19 engages with a contact 21 when the temperature surrounding said switch drops to a predetermined point. Current then flows from the conductor 18 through the arm 20, the contact 21, and thence through a conductor 22, the latter leading to a resistance or heating coil 23 which surrounds a bimetallic warping bar 24. The free end of this bar is linked as at 25 with the arm 12, and it will be seen that as the bar 24 flexes or distorts in response to the operating temperatures of the coil 23, the arm 12 will be rocked about its pivot in order to impart movement to the cable 11. This movement is such as to elevate the check door 8 when the rooms of a building heated by the furnace attain a predetermined high temperature, and to lower the check door when the temperature of such rooms falls to a predetermined level. Also, the arm 12 has connected therewith one end of a second cable 26 which is trained over suitable guides and has its other end connected with a hinged draft door 27 carried by the ashpit door 4, the operation being such that when the check door 8 is closed, the draft door 27 is opened and vice versa.

Conductors 28 and 29 extend from the return side of the heating or resistance coil 23 to the transformer 17, completing the circuit to said coil when the arm 20 is in engagement with the contact 21. The switch 19 is also employed to control the opening and closing of a supplemental circuit 30, in which is positioned a resistor 31 or other equivalent type of heating element. This resistor is disposed in the smoke pipe 5 near its position of communication with the chimney 6. It frequently happens when the rate of fuel combustion in the furnace is maintained at its lowest level, that cold or dampness will settle in a chimney and produce a stoppage or sometimes a reverse flow of air through the smoke pipe and furnace, thereby causing the furnace to produce smoke in the room in which it is situated, as well as curtailing fuel combustion in the furnace. By the use of the resistor 31, I provide a positive means for heating the chimney, particularly when the furnace is undergoing low stage fuel combustion, and thereby maintain normal drafts

in an upwardly and outwardly flowing direction within the chimney. The resistor 31 is preferably arranged in the circuit 30 with the arm 20 of the switch 19 in engagement with an arcuate contact bar 33. Thus when the check door is elevated, the resistor 31 will be automatically energized, and when the check door is lowered, through the operation of the switch 19, the resistor will be deenergized. The resistor is mounted in the smoke pipe 5 so that it may be conveniently removed for inspection or replacement purposes.

Another important feature of the invention in the matter of proper draft regulation for the furnace 1 is the employment of a supplemental air shutter 34 in the sleeve 7. This shutter is mounted so that it rocks about a centrally disposed pivot 35 and thereby regulates air flow through said sleeve and into the smoke pipe. I have found that the ordinary operation of the check door 8 is not of itself completely satisfactory in maintaining low stage combustion of the fuel in the furnace 1. It sometimes occurs, when the check door is open and the fuel combustion rate lowered, that insufficient draft is present to maintain low stage fuel combustion. This difficulty is overcome by means of the shutter 34, which is automatically adjusted in its working positions by means of a curved bimetallic thermoresponsive strip 36. This strip is arranged directly in the smoke pipe 5 and has one end secured, as at 37, thereto. The free or movable end of the strip 36 is joined by a link 38 with an off-center ear 39 formed with the shutter 34. By the use of this construction, when the check door 8 is opened and should the temperature of the flowing gases within the smoke pipe fall below a predetermined level, the resulting flexure of the strip 36 will serve to move the shutter to positions obstructing or partially obstructing the flow of extraneous air into the smoke pipe through the sleeve 7.

By the correlated action of the afore-described instrumentality, I am able to maintain in a natural draft furnace the delivery of requisite volumes of air to the fuel bed to maintain combustion of the fuel for all operational requirements.

I claim:

1. Draft control apparatus for the waste gas outlet of a furnace comprising, a conduit for conducting waste gas from a furnace to an associated chimney, said conduit being provided in its length with a check door opening, a pivoted check door for said opening governing the flow of room air into said conduit and its exclusion therefrom, a thermostatic regulator, responsive to room temperature for controlling the position of said check door, an electrically energized heater arranged in said conduit between said check door and the associated chimney to heat gas therein and thus promote flow of gas to said chimney through said conduit, and a control circuit for said heater including a switch actuated by said regulator for effecting energization of the heater when the check door is open and deenergization of the heater when the check door is closed.
2. Draft control apparatus for fuel-burning furnaces, comprising a conduit for conducting waste gas from a furnace to an associated chimney, said conduit being provided with a check door opening, a pivoted check door for said opening governing the flow of room air into said conduit and its exclusion therefrom, thermostatic means responsive to room temperature for automatically moving said check door between its opened and closed positions, said means embodying a movable member mechanically connected with said door, a bimetal element warpable in response to heat for moving said member to open and close said door, an electric heater for said warpable member, a control circuit for said electric heater, a second electrically energized heater situated in said conduit between said opening and the associated chimney, a control circuit for said second heater, and a switch common to said control circuits and controlled by said thermostatic means, said switch effecting deenergization of said second heater when said check door is closed by warping of said bimetal member and energization of the second heater when the check door is opened by said warpable member.

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